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TITLE: **Waste** melting furnace for fusion process of recovery objects from **incineration** furnaces - has silicon carbide layer arranged around granular **graphite** objects of resistance heat emitting body filled between vertical crucible periphery and counter **electrode** pair

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BASIC-ABSTRACT:

Waste melting furnace (1) comprises a furnace main body (2) closed at the bottom and formed with an opening at the upper end blockaded by an openable and

closable furnace lid (3). A vertical crucible (8) is arranged at the central
section of the furnace main body for processing the fusion raw material
inserted from a feeding device (22) provided at the side attachment wall of the
furnace lid. A pair of counter electrodes are arranged in mutual opposition at
a predetermined interval maintained at the periphery of the vertical crucible.
A resistance heat emitting body (9) is filled between the counter electrodes
and the vertical crucible. A melt ejection device (12) is connected at the
lower side of the vertical crucible. The heat resisting body is a mixture of
granular graphite objects having predetermined particle size classified into
two kinds and mixed at a predetermined volume mixing ratio. A silicon carbide
layer (5) is arranged at the perimeter of the granular graphite objects.

USE - In fusing fly ashes and incineration ashes discharged from municipal
solid waste incinerators, sludge incinerators, industrial waste furnaces by
adding additives and reducing them into harmless matter for reuse as melt.

ADVANTAGE - Heats fusion raw material by resistance heat emitting body.
Improves energy efficiency. Prevents oxidation of graphite. Eliminates load
fluctuation. Ensures large power factor. Suppresses generation of unnecessary
exhaust gas. Prevents mixing of insoluble objects with melt. Discharges melt
smoothly. Achieves quantification and resource recovery. Improves current
density for every unit product. Increases electric power load and endurance of
heat emitting body.

CHOSEN-DRAWING: Dwg.1/2

TITLE-TERMS: **WASTE** MELT FURNACE FUSE PROCESS RECOVER OBJECT **INCINERATION**
FURNACE SILICON CARBIDE LAYER ARRANGE GRANULE **GRAPHITE** OBJECT

RESISTANCE HEAT EMIT BODY FILLED VERTICAL CRUCIBLE PERIPHERAL COUNTER **ELECTRODE** PAIR

DERWENT-CLASS: D15 J09 Q73 Q77

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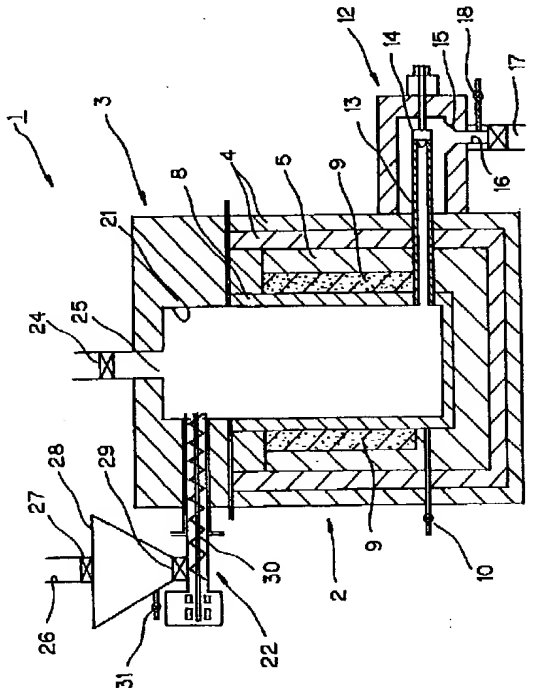
(54)【発明の名称】　廃棄物溶融炉

(57)【要約】
【課題】　排ガス量が少なく、エネルギー効率を向上させ、且つ小型化可能で溶解物の再資源化が可能な一般廃棄廃棄物焼却灰等を溶融する廃棄物溶融炉を提供する。
【解決手段】　炉本体２を構成する耐火レンガ層４の内側に炭化珪素質層５を積層し、その内側に対向電極６，７を配設し、炭化珪素質層５の中央部に溶融原料が投入される縦型ルツボ８を配設する。対向電極６，７間で且つ炭化珪素質層５及び縦型ルツボ８間に２種類の粒度に分級された黒鉛粒状物を所定体積混合割合で混合した混合物でなる抵抗発熱体９が設けられている。縦型ルツボ８の下部側には溶解物排出機構１２を連通して、不溶解物の混入しない溶解物を外部に排出する。炉蓋３には側壁に溶融原料を供給する原料供給機構２２が設けられている。



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【特許請求の範囲】

【請求項１】　上端を開放した炉本体と、該炉本体の上端を開閉自在に閉塞する炉蓋とを備え、前記炉本体には、その中央部に配設された溶融原料が投入される縦型ルツボと、該縦型ルツボの回りに所定間隔を保って配設された一対の対向電極と、該対向電極と前記縦型ルツボとの間に充填された抵抗発熱体と、前記縦型ルツボの下部側側面に連通された溶融物排出機構とを有し、前記抵抗発熱体は、二種類に分級した所定粒度の黒鉛粒状物を所定の体積混合割合で混合された混合物と、該黒鉛粒状物の周囲に配設した炭化珪素質層とで構成されていることを特徴とする廃棄物溶融炉。

【請求項２】　前記黒鉛粒状物の所定粒度の一方は直径２．５～５．０ｍｍに、他方は直径６～１２ｍｍに分級され、両者が前者を１部に対して後者を１３～１５部の体積混合物割合で混合されていることを特徴とする請求項１に記載の廃棄物溶融炉。

【請求項３】　前記黒鉛粒状物の混合物の底面、側面及び上面の全てが炭化珪素質層で覆われていることを特徴とする請求項１または２に記載の廃棄物溶融炉。

【請求項４】　前記抵抗発熱体には酸化防止用不活性ガスが導入されていることを特徴とする請求項１乃至３の何れかに記載の廃棄物溶融炉。

【請求項５】　前記溶融物排出機構は、縦型ルツボの最下端部側面に連通されていることを特徴とする請求項１乃至４の何れかに記載の廃棄物溶融炉。

【請求項６】　前記縦型ルツボに投入される溶融原料は、一般廃棄物焼却灰、飛灰、産業廃棄物燃えがら、有機性汚泥、無機性汚泥、石炭灰等の何れか１つまたはこれらの混合物に添加物を加えて調整された物であることを特徴とする請求項１乃至５の何れかに記載の廃棄物溶融炉。

【発明の詳細な説明】

【発明の属する技術分野】本発明は廃棄物を溶融処理するための廃棄物溶融炉に係り、例えば都市ごみ焼却炉、汚泥焼却炉及び産業廃棄物炉から排出される焼却灰、これらを焼却する際に発生する飛灰、これらの焼却灰と飛灰との混合物等に添加物を加えて溶融処理し、減容化して無害化し、溶融物を再利用するための再起物を溶融処理するための廃棄物溶融炉に関する。

【０００２】

【従来の技術】従来、例えば都市ごみ焼却炉から排出される焼却灰を溶融固化させて、減容化及び無害化を図るためにはコークスベッド溶融炉、表面溶融炉、旋回流溶融炉等の燃料焚溶融炉やプラズマ溶融炉、電気アーク炉、電気抵抗炉、マイクロ波溶融炉等の電気溶融炉が使用されている。

【０００３】ここで、燃料焚溶融炉としては、例えば特開平６－１１１２７号公報（以下、第１従来例と称す）に記載されているものがあり、電気溶融炉としては例えば特開平７－２９４１５６号公報（以下、第２従来例と称す）や特開平７－４９１８５号公報（以下、第３従来例と称す）に記載されているものがある。

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【０００４】第１従来例には、灰を加熱用バーナで加熱して溶融させる灰溶融炉を、炉本体内に形成した予熱室とこれに連通する加熱用バーナを配設した溶融室とで構成し、灰を貯蔵するホッパーから灰を予熱室を介して溶融室に送給して、加熱用バーナで加熱溶融させ、次いで冷却槽で固化させるようにした灰溶融炉が記載されている。

【０００５】第２従来例には、皿状の炉本体とその上面に被着された炉蓋とを有し、炉本体の上下中央部に開設された溶融スラグ排出口と、炉蓋から炉内に装入された電極と、炉蓋に開設された廃棄物投入口、空気供給口及び廃棄口とを備えた三相交流アーク炉と、その溶融スラグ排出口に連通された溶融スラグ空冷装置とを備えた廃棄物溶融処理装置が開示されている。

【０００６】第３従来例には、給電電極が配設された上方に開口した炉体と、この炉体の内部に上下に積層状態に充填された上層用抵抗発熱体と下層用抵抗発熱体とを具備し、上層用抵抗発熱体は炭化微粒子と所定温度以上で導電化する無機質耐熱材との混練焼成材を破砕分級して得た粉末状物で構成され、下層用抵抗発熱体は、木炭等を破砕分級して得た平均粒度１ｍｍ乃至５ｍｍの炭素粒状物で構成されて、これら抵抗発熱体で通電によって３０００℃程度の高温加熱を行うようにした電気抵抗発熱炉が記載されている。

【０００７】

【発明が解決しようとする課題】然し乍ら、前記第１従来例の灰溶融炉にあっては、灰を移動させながら予熱した後に加熱用バーナで溶融するようにしているので、灰の移動速度が速すぎると、加熱用バーナの溶融能力を越えた灰が溶融室に搬入され、溶融室における灰の滞留時間を十分に確保できず、未溶融の灰が排出されてしまい、再度溶融炉に投入し直さなければならないという問題点がある。また、未溶融の灰が排出口を閉塞して炉操業の停止を余儀なくされることもある。更に、ホッパーから溶融室まで灰を移動させる間に灰が固着することも生じる。これらの不具合によって、全体としての炉の稼働効率が低下するという問題点がある。

【０００８】また、第２従来例にあっては、炉本体が皿状であるため、設置面積が大きくなると共に、エネルギー効率の面からも好ましいものではなく、更に溶融物を湯面からのオーバーフローによって排出しているので、溶融物の排出時に不溶解物が少量混入することは避けられず、溶融スラグの再利用に大きな問題となる等の未解決の課題がある。

【０００９】更に、第３従来例にあっては、上層用抵抗発熱体及び下層用抵抗発熱体で高温の熱源を構成しているので、これら発熱体の周囲が局部的に高温となり、耐

火物の溶損が起こることから、これを補修する必要があり、どうしても稼働率が低下するという問題点がある。また、主成分である物質までも蒸発させ、溶融処理で発生する集塵量が増し、その処理費用が嵩むという問題点もある。更に、電極部分が高温の熱源になれば多量の冷却水が使用され、この冷却水が持ち去る熱量が多くなり、エネルギー効率が低下するという問題点もある。

【００１０】一方、斯かる従来の装置には灰等を溶融するための空気、キャリヤーガス及び電極と空気との反応による発生ガス等の排ガスが多量となり、２次公害の発生または排ガスの処理設備の大規模化が問題となっている。

【００１１】そこで、本発明は、上記従来例の未解決の課題に着目してなされたものであり、排ガス量を少なくすると共に、局部的な加熱による耐火物の溶損を防止し、更にエネルギー効率を向上させ、且つ装置全体を小型化すると共に、溶融スラグの再資源化を容易とすることができる廃棄物溶融炉を提供することを目的としている。

【００１２】

【課題を解決ための手段】上記目的を達成するために、請求項１に係る廃棄物溶融炉は、上端を開放した炉本体と、該炉本体の上端を開閉自在に閉塞する炉蓋とを備え、前記炉本体には、その中央部に配設された溶融原料が投入される縦型ルツボと、該縦型ルツボの回りに所定間隔を保って配設された一対の対向電極と、該対向電極と前記縦型ルツボとの間に充填された抵抗発熱体と、前記縦型ルツボの下部側側面に連通された溶融物排出機構とを有し、前記抵抗発熱体は、二種類に分級した所定粒度の黒鉛粒状物を所定の体積混合割合で混合された混合物と、該黒鉛粒状物の周囲に配設した炭化珪素質層とで構成されていることを特徴とする。

【００１３】この請求項１に係る発明においては、縦型ルツボに溶融原料が投入され、その周囲に配設された抵抗発熱体で加熱するのでエネルギー効率が向上すると共に、抵抗発熱体を構成する黒鉛粒状物の周囲に炭化珪素質層が配設されているので、これらの酸化を防止して、不要な排ガスの発生を抑制することができる。

【００１４】また、縦型ルツボ内の溶融物の排出口が縦型ルツボの下部側に配設されているので、不溶解物が混入することなく、溶融物を炉外にスムーズに排出することができ、定量化が可能となり、再資源化を達成することができる。

【００１５】更に、抵抗発熱体を二種類に分級した黒鉛粒状物の混合物で構成することにより、一方の黒鉛粒状物間に他方の黒鉛粒状物が入り込んで周密状態となり、単位体積当たりの電流密度を向上させて、電力負荷の増大をはかることができると共に、抵抗発熱体の耐久性を向上させることができる。

【００１６】更にまた、発熱体が電気抵抗式であるので、負荷変動がなく、力率が大きいと共に、電気ノイズ、フリッカー等の電気的障害、騒音、アークによる電極直下の局部加熱による損耗というトラブルを確実に避けることができ、しかも静かな溶融が可能であるため、溶融物に不溶融物が混入することがない。

【００１７】また、請求項２に係る廃棄物溶融炉は、請求項１に係る発明において、前記黒鉛粒状物の所定粒度の一方は直径２．５～５．０ｍｍに、他方は直径６～１２ｍｍに分級され、両者が前者を１部に対して後者を１３～１５部の体積混合物割合で混合されていることを特徴とする。

【００１８】この請求項２の発明においては、上記粒度と体積混合割合を選択することにより、大きい方の粒度の黒鉛粒状物間に小さい方の粒度の黒鉛粒状物が適度に入り込んで良好な周密状態となり、単位体積当たりの電流密度を向上させて、電力負荷の増大をはかることができると共に、抵抗発熱体の耐久性を向上させることができる。

【００１９】更に請求項３に係る廃棄物溶融炉は、請求項１または２の発明において、前記黒鉛粒状物の混合物の底面、側面及び上面の全てが炭化珪素質層で覆われていることを特徴とする。

【００２０】この請求項３の発明においては、黒鉛粒状物の混合物の周囲全てが炭化珪素質層で覆われているので、黒鉛粒状物の酸化を確実に防止して、不要な排ガスの発生を確実に阻止することができる。

【００２１】更にまた、請求項４に係る廃棄物溶融炉は、請求項１乃至３の何れかの発明において、前記抵抗発熱体には酸化防止用不活性ガスが導入されていることを特徴とする。

【００２２】この請求項４に係る発明においては、抵抗発熱体に酸化防止用不活性ガスが導入されているので、抵抗発熱体を構成する黒鉛粒状物の酸化を確実に阻止して、不要な排ガスの発生を確実に防止することができる。

【００２３】尚更に、請求項５に係る廃棄物溶融炉は、請求項１乃至４の何れかの発明において、前記溶融物排出機構は、縦型ルツボの最下端部側面に連通されていることを特徴とする。

【００２４】この請求項５に係る発明においては、縦型ルツボの最下部側面に溶融物排出部が連通されているので、溶融物に不溶解物が混入することなく、円滑に排出することができる。

【００２５】また、請求項６に係る廃棄物溶融炉は、請求項１乃至５に係る発明の何れかにおいて、前記原料供給機構で投入される溶融原料は、一般廃棄物焼却灰、飛灰、産業廃棄物燃えがら、有機性汚泥、無機性汚泥、石炭灰等の何れか１つまたはこれらの混合物に添加物を加えて調整された物であることを特徴とする。

【００２６】この請求項６に係る発明においては、一般

廃棄物焼却灰、飛灰、産業廃棄物燃えがら、有機性汚泥、無機性汚泥、石炭灰等の何れか1つまたはこれらの混合物に添加物を加えて調整された物を確実に溶融処理することができる。

【0027】

【発明の実施の形態】以下本発明に係る廃棄物溶融炉を図面を参照して詳述する。図1及び図2は本発明の実施の形態を示す縦断面図及び横断面図である。

【0028】図中、1は廃棄物溶融炉であって、有底角筒状を呈して上面を開放した炉本体2と、その上面を開閉自在に閉塞する炉蓋3とを備えている。

【0029】炉本体2は、有底角筒状に形成された2層の耐火レンガ層4と、その内周面側に配設された炭化珪素（ＳｉＣ）質層5と、この炭化珪素質層5の内周部に図2に示すように所定距離を保って配設された一対の対向電極6，7と、炭化珪素質層5の中央部に配設された縦型ルツボ8と、対向電極6，7間で且つ炭化珪素質層5及び縦型ルツボ8間の空間部に炭化珪素質層5で上下及び側面の全てを覆われて配設された抵抗発熱体9とを備えている。

【0030】ここで、抵抗発熱体9は、直径2．5～5．0mmに分級された黒鉛粒状物と、直径6～12mmに分級された黒鉛粒状物との二種類の黒鉛粒状物が前者を1部に対して後者を13～15部の体積混合割合で混合されている。

【0031】このように、抵抗発熱体9を二種類の黒鉛粒状物を所定の体積混合割合で混合することにより、粒度の大きい黒鉛粒状物の間に粒度の小さい黒鉛粒状物が適度に入り込んで好適な周密状態となり、単位体積当たりの電流密度を向上させて、電力負荷の増大をはかることができると共に、抵抗発熱体9の耐久性を向上させることができる。

【0032】また、抵抗発熱体9及び炭化珪素質層5の内周側には、不活性ガス導入口10から窒素ガス等の不活性ガスが供給され、抵抗発熱体9及び炭化珪素質層5の内周部が縦型ルツボ8の上端より上方の圧力よりも正圧となるように加圧され、後述するように溶融材料の溶融に伴う排ガスが抵抗発熱体9及び炭化珪素質層5に侵入することを確実に阻止すると共に、これらの酸化を確実に防止することができる。

【0033】更に、縦型ルツボ8の最下端側側面部に炭化珪素質層5及び耐火レンガ層4を貫通する溶融物排出機構12が連通されている。

【0034】この溶融物排出機構12は、縦型ルツボ8に一端が挿通された溶湯ノズル13と、この溶湯ノズル13の他端に配設されたその開口面積を制御して流量制御を行う流量調整部14と、この流量調整部14から流下する溶融物を受ける受皿15と、この受皿15に連通して下方に延長する流下通路16に介挿されたタップ口17とで構成されている。

【0035】ここで、溶湯ノズル13の炉本体2外には図2に示すように補助ヒータ19が巻装され、この補助ヒータ19によって溶融物を固化することなくスムーズに、しかも定量が可能な状態で排出することができる。

【0036】また、流下通路16には不活性ガス導入口18が連通されて窒素ガス等の不活性ガスが導入されることにより、タップ口17からの空気の侵入を防止している。

【0037】一方、炉蓋3には、その下端面に縦型ルツボ8に対向してその内径と等しい直径の円形凹部21が形成され、この円形凹部21の側壁に開口して炉蓋3を貫通して原料供給機構22が配設されていると共に、円形凹部21の底部に開口して炉蓋3を上方に貫通し且つ圧力調整弁24を有する排ガス排出路25が連通されている。

【0038】ここで、圧力調整弁24は、炉内圧が10～50mmH_2Oに調整可能で、円形凹部21内を正圧に維持している。

【0039】原料供給機構22は、上部の原料供給路26及び上部スライドバルブ27を介して供給される溶融原料を貯留する原料ホッパー28と、このホッパー28の下端側の切り出し口に配設された下部スライドバルブ29の下端側に連接された定量スクリューフィーダ30とを有する。

【0040】ここで、原料ホッパー28の底部側壁には溶融原料が持ち込む空気を不活性ガスで除去するための不活性ガス導入口31が連通され、下部スライドバルブ29を閉じ、上部スライドバルブ27を開放している状態で不活性ガス導入口31から窒素ガス等の不活性ガスを導入することにより、ホッパー28内の空気を不活性ガスに置換することができる。

【0041】また、原料供給路26を通じて供給される溶融原料としては、一般廃棄物焼却灰、飛灰、産業廃棄物燃えがら、有機性汚泥、無機性汚泥、石炭灰等の何れか1つまたはこれらの混合物に添加物を加えて調整された物である。

【0042】以上が本発明の実施の形態の一例を示す構成であるが、次にその動作を説明する。今、原料ホッパー28に所定量の溶融原料を投入し、その内部が不活性ガス導入口31からの不活性ガスで充満されている状態で、下部スライドバルブ29を開けて原料供給機構22の定量スクリューフィーダ30で溶融原料を縦型ルツボ8内の溶解物上に定量投入する。

【0043】このとき、対向電極6，7には直流電源からの直流高電力が通電されて、抵抗発熱体9が発熱状態にあり、縦型ルツボ8を所定温度に加熱することにより、投入される溶融原料を順次溶融させる。

【0044】また、縦型ルツボ8内に長時間滞留して完全に溶融した溶解物は縦型ルツボ8の下部に設けられた溶解物排出機構12の溶湯ノズル13を通じて流量調整

部14で流量調整しながらタップ口17を介して外部に不溶解物が混入することなく排出される。

【0045】このとき、投入された溶融原料が長時間縦型ルツボ8内に滞留することにより、溶融原料に含まれる有害物質の殆どは蒸発して排ガス中に含まれることになり、排ガス排出路25を通じて系外に排出されて保集されるので、排出される溶融物に不純物が混入されることが確実に阻止されて再利用が可能となる。

【0046】そして、縦型ルツボ8から排出された溶解物は溶湯ノズル13の回りに巻装された補助ヒータ19によって加熱されることにより、固化することなく、円滑に外部に排出されると共に、不活性ガス導入口18からの不活性ガスが受皿15及び溶湯ノズル13の周囲が充満されているので、外部からの空気の侵入を阻止して溶解物排出機構12の酸化を防止して、耐久性を向上させている。

【0047】更に、炉本体2の縦型ルツボ8の回りに配設されている抵抗発熱体9及び炭化珪素質層5は、不活性ガス導入口10から供給される不活性ガスによって縦型ルツボ8の上部側に比較して正圧となるように維持されているので、縦型ルツボ8で発生する排ガスが抵抗発熱体9を含む炭化珪素質層5に侵入することが確実に阻止され、これによって、対向電極6，7、抵抗発熱体9の酸化や炭化珪素質層5の浸食を防ぐことができ、炉本体2の耐久性を従来例に比較して大幅に向上させることができる。

【0048】尚、上記の実施の形態においては、縦型ルツボ8の最下部の側壁に溶解物排出機構12を連通させる場合について説明したが、これに限定されるものではなく、縦型ルツボ8の上下方向の中央部より下側で内部の不溶解物が混入されない位置に溶解物排出機構12を連通させるようにしてもよい。

【0049】また、上記の実施の形態では、原料供給機構22に定量スクリューフィーダ30を適用する場合について説明したが、これに限定されるものではなく、ロータリーフィーダを適用して定量切り出しを行うようにしてもよく、更には、ベルトフィーダを適用するようにしてもよい。

【0050】

【発明の効果】以上説明したように、請求項1に係る発明によれば、縦型ルツボに溶融原料が投入され、その周囲に配設された抵抗発熱体で加熱するのでエネルギー効率が向上すると共に、抵抗発熱体を構成する黒鉛粒状物の周囲に炭化珪素質層が配設されているので、これらの酸化を防止して、不要な排ガスの発生を抑制することができる。

【0051】また、縦型ルツボ内の溶融物の排出口が縦型ルツボの下部側に配設されているので、不溶解物が混入することなく、溶融物を炉外にスムーズに排出することができ、定量化が可能となり、再資源化を達成することができる。

【0052】更に、抵抗発熱体を2種類に分級した黒鉛粒状物の混合物で構成することにより、一方の黒鉛粒状物間に他方の黒鉛粒状物が入り込んで周密状態となり、単位体積当たりの電流密度を向上させて、電力負荷の増大をはかることができると共に、抵抗発熱体の耐久性を向上させることができる。

【0053】更にまた、発熱体が電気抵抗式であるので、負荷変動がなく、力率が大きいと共に、電気ノイズ、フリッカー等の電気的障害、騒音、アークによる電極直下の局部加熱による損耗というトラブルを確実に避けることができ、しかも静かな溶融が可能であるため、溶融物に不溶融物が混入することがない。

【0054】更に、縦型ルツボ内の溶融物の排出口が縦型ルツボの下部側に配設されているので、不溶解物が混入することなく、溶融物を炉外にスムーズに排出することができ、定量化が可能となり、再資源化を達成することができる。

【0055】また、請求項2に係る発明によれば、上記粒度と体積混合割合を選択することにより、大きい方の粒度の黒鉛粒状物間に小さい方の粒度の黒鉛粒状物が適度に入り込んで良好な周密状態となり、単位体積当たりの電流密度を向上させて、電力負荷の増大をはかることができると共に、抵抗発熱体の耐久性を向上させることができる。

【0056】更に、請求項3に係る発明によれば、黒鉛粒状物の混合物の周囲全てが炭化珪素質層で覆われているので、黒鉛粒状物の酸化を確実に防止して、不要な排ガスの発生を確実に阻止することができる。

【0057】更にまた、請求項4に係る発明によれば、抵抗発熱体に酸化防止用不活性ガスが導入されているので、この不活性ガスが抵抗発熱体及び対向電極の回りに流れ込み、縦型ルツボの外周部上部側を外気圧より高い正圧に維持することができ、対向電極及び抵抗発熱体の酸化を防止する一方、排ガスによる耐火レンガの浸食を防ぎ廃棄物溶融炉の耐久性を向上させることができる。このため、排ガス量の殆どを原料から発生する排ガスのみとして排ガス量を減少させることができ、排ガス量の持ち去るダスト量も減少させることができ、更に排ガス中のNOx、SOx等の規制値の厳しいガス組成の低減が可能となり、2次公害の発生を抑制することができる。

【0058】更に、請求項5に係る発明によれば、縦型ルツボの最下部側面に溶融物排出部が連通されているので、溶融物に不溶解物が混入することなく、円滑に排出することができる。

【0059】更にまた、請求項6に係る発明によれば、一般廃棄物焼却灰、飛灰、産業廃棄物燃えがら、有機性汚泥、無機性汚泥、石炭灰等の何れか1つまたはこれらの混合物に添加物を加えて調整された物を確実に溶融処

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理することができる。

【図面の簡単な説明】

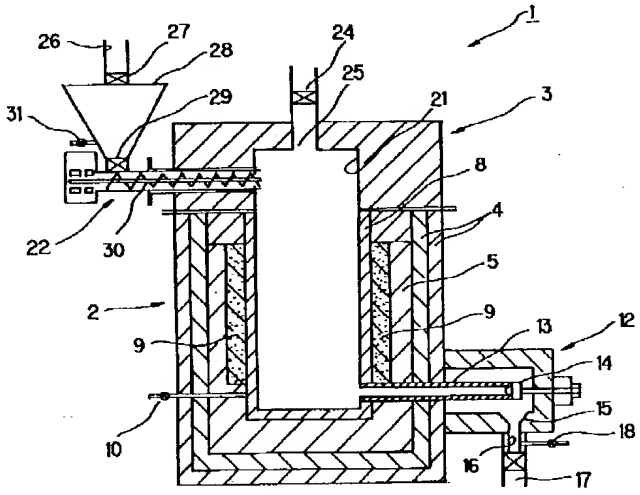
【図１】本発明に係る廃棄物溶融炉の縦断面図。

【図２】本発明に係る廃棄物溶融炉の横断面説明図である。

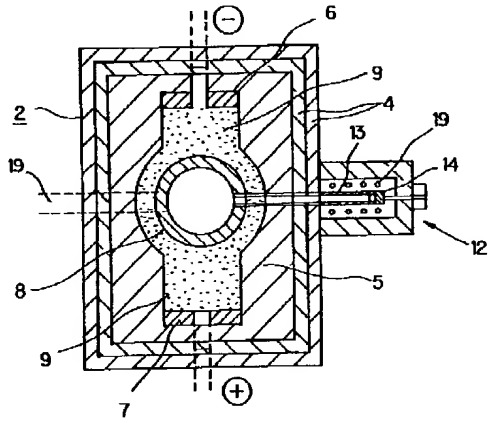
【符号の説明】

1　廃棄物溶融炉
2　炉本体
3　炉蓋
4　耐火レンガ層
5　炭化珪素質層
6　対向電極
7　対向電極
8　縦型ルツボ
9　抵抗発熱体
10　不活性ガス導入口
12　溶解物排出機構
13　溶湯ノズル
14　流量調整部
17　タップ口
18　不活性ガス導入口
19　補助ヒーター
22　原料供給機構
25　排ガス排出路
26　原料供給路
27　上部スライドバルブ
28　原料ホッパー
29　下部スライドバルブ
30　定量スクリューフィーダ
31　不活性ガス導入口

【図１】



【図２】



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[The technical field to which invention belongs] This invention adds an additive to the mixture of the fly ash generated in case the burned ash and these which start the trash melting furnace for carrying out melting processing of the trash, for example, are discharged from a municipal-solid-waste incinerator, a sludge incinerator, and an industrial waste furnace are incinerated, and these burned ash and fly ash etc., carries out melting processing, reduction-izes, defangs, and relates to the trash melting furnace for carrying out melting processing of the recovery object for reusing melt.
[0002]
[Description of the Prior Art] The melting solidification of the burned ash discharged from the conventional, for example, municipal solid waste, incinerator is carried out, and in order to attain reduction-izing and defanging, electric melting furnaces, such as fuel ********, such as a corks base melting furnace, a surface melting furnace, and a turning style melting furnace, a plasma melting furnace, an electric arc furnace, an electric resistance furnace, and a microwave melting furnace, are used.
[0003] Here, as fuel ********, there are some which are indicated by JP,6-11127,A (the 1st conventional example is called hereafter), for example, and there are some which are indicated by JP,7-294156,A (the 2nd conventional example is called hereafter) and JP,7-49185,A (the 3rd conventional example is called hereafter) as an electric melting furnace.
[0004] The ashes melting furnace which heats and carries out melting of the ashes to the 1st conventional example by the burner for heating It constitutes from a preheating room formed in the furnace main part, and a melting room which arranged the burner for heating which is open for free passage to this, ashes are fed into a melting room through a preheating room from the hopper which stores ashes, heating melting is carried out by the burner for heating, and the ashes melting furnace rank second and it was made to solidify by the cooling pool is indicated.
[0005] The molten slag exhaust port which has a dished furnace main part and the door put on the upper surface for the 2nd conventional example, and was established in the up Shimonaka center section of a furnace main part, The trash melting processor equipped with the three-phase-alternating-current arc furnace equipped with the electrode inserted in in the furnace from the door, and the trash input port, air supply opening and abolition opening which were established by the door, and the molten slag air-cooling device opened for free passage by the molten slag exhaust port is indicated.
[0006] For the 3rd conventional example, the furnace body which carried out the opening to the upper part in which the feed electrode was arranged, and the resistance heating element for the upper layers and the resistance heating element for lower layers with which the laminating condition was filled up up and down inside this furnace body are provided. The resistance heating element for the upper layers consists of powdered objects which carried out crushing classification and obtained kneading baking material with the minerals heat resisting material which are a carbonization particle and beyond predetermined temperature and is electric-conduction-ized. The resistance heating element for lower layers The electric resistance exoergic furnace which consists of the average grain size of 1mm thru/or

the 5mm carbon granule-like objects which carried out crushing classification and obtained charcoal etc., and was made to perform about 3000-degree C heating at high temperature by energization with these resistance heating element is indicated.
[0007]
[Problem(s) to be Solved by the Invention] However, if it is in the ashes melting furnace of ** et al. and said 1st conventional example Since he is trying to fuse by the burner for heating after preheating moving ashes When ashy passing speed is too quick, the ashes beyond the melting capacity of the burner for heating will be carried in to a melting room, and the residence time of the ashes in a melting room will not fully be able to be secured, but the ashes of non-melting will be discharged, and there is a trouble that it must resupply to a melting furnace again. Moreover, the ashes of non-melting may blockade an exhaust port and may be obliged to a halt of furnace operation. Furthermore, while moving ashes from a hopper to a melting room, that ashes fix also arises. There is a trouble that the operation effectiveness of the furnace as the whole falls according to such nonconformities.
[0008] Moreover, if it is in the 2nd conventional example, since a furnace main part is dished, while installation area becomes large, it is not desirable from the field of energy efficiency, and since melt is further discharged by overflow from the surface of hot water, it is not avoided that a non-melt carries out little mixing at the time of blowdown of melt, but unsolved technical problems, such as becoming a big problem, are in reclamation of molten slag.
[0009] Furthermore, if it is in the 3rd conventional example, since the heat source hot with the resistance heating element for the upper layers and the resistance heating element for lower layers is constituted, the perimeter of these heating elements serves as an elevated temperature locally and the erosion of refractories happens, it is necessary to repair this and there is a trouble that an operating ratio surely falls. Moreover, even the matter which is a principal component is evaporated and the trouble that increase and its processing costs increase also has the amount of dust collection generated in melting processing. Furthermore, if an electrode section becomes a hot heat source, a lot of cooling water will be used, this cooling water has, last quantity of heat increases, and there is also a trouble that energy efficiency falls.
[0010] On the other hand, exhaust gas, such as air for fusing ashes etc. to this conventional equipment, carrier gas, and generating gas by the reaction of an electrode and air, becomes abundant, and large-scale-ization of generating of secondary nuisance or processing equipment of exhaust gas poses a problem.
[0011] Then, it aims at offering the trash melting furnace which can make recycling of molten slag easy while this invention prevents the erosion of the refractories by local heating, raises energy efficiency further while it is made paying attention to the unsolved technical problem of the above-mentioned conventional example and lessens the amount of exhaust gas, and it miniaturizes the whole equipment.
[0012]
It is [technical problem Means] of a solution sake In order to attain the above-mentioned object, the trash melting furnace concerning claim 1 It has the furnace main part which opened the upper bed, and the door blockaded for the upper bed of this furnace main part, enabling free closing motion. On said furnace main part The vertical mold crucible into which the melting raw material arranged in the center section is thrown, and the counterelectrode of the couple which maintained the predetermined gap and was arranged in the surroundings of this vertical mold crucible, It has the resistance heating element with which it filled up between this counterelectrode and said vertical mold crucible, and the melt blowdown device opened for free passage by the lower part side side of said vertical mold crucible. Said resistance heating element It is characterized by consisting of silicon carbide **** which arranged the graphite granular object of predetermined grain size which classified in two kinds in the perimeter of the mixture mixed at a predetermined volume mixing rate, and this graphite granular object.
[0013] In invention concerning this claim 1, since silicon carbide **** is arranged in the perimeter of the graphite granular object which constitutes a resistance heating element while energy efficiency improves, since it heats with the resistance heating element which the melting raw material was thrown into the vertical mold crucible, and was arranged in that perimeter, these oxidation can be prevented and

generating of unnecessary exhaust gas can be controlled.
[0014] Moreover, without a non-melt mixing, since the exhaust port of the melt in a vertical mold crucible is arranged in the lower part side of a vertical mold crucible, melt can be smoothly discharged outside a furnace, quantification becomes possible, and recycling can be attained.
[0015] Furthermore, while the graphite granular object of another side can enter between one graphite granular objects, being able to be in a circumferential dense condition, being able to raise the current density per unit volume and being able to aim at buildup of a power load by constituting a resistance heating element from mixture of the graphite granular object which classified in two kinds, the endurance of a resistance heating element can be raised.
[0016] Furthermore, while there is no load effect and a power-factor is large, the trouble of the consumption by the local heating directly under an electrode by electric failures, such as an electric noise and a flicker, the noise, and the arc is certainly avoidable, and since a heating element is an electric resistance type, since quiet melting is possible, moreover, non-melt does not mix in melt again.
[0017] Moreover, in invention which the trash melting furnace concerning claim 2 requires for claim 1, one side of the predetermined grain size of said graphite granular object is made into the diameter of 2.5-5.0mm, the classification of another side is carried out to the diameter of 6-12mm, and it is characterized by mixing [former] both at a volume mixture rate of the 13 to 15 section in the latter to the one section.
[0018] In invention of this claim 2, while the graphite granular object of the grain size of the smaller one can enter moderately between the graphite granular objects of the grain size of the larger one, being able to be in a good circumferential dense condition, being able to raise the current density per unit volume and being able to aim at buildup of a power load by choosing the above-mentioned grain size and a volume mixing rate, the endurance of a resistance heating element can be raised.
[0019] Furthermore, the trash melting furnace concerning claim 3 is characterized by covering all the bases of the mixture of said graphite granular object, the sides, and upper surfaces by silicon carbide **** in invention of claims 1 or 2.
[0020] In invention of this claim 3, since all the perimeters of the mixture of a graphite granular object are covered by silicon carbide ****, oxidation of a graphite granular object can be prevented certainly and generating of unnecessary exhaust gas can be prevented certainly.
[0021] Furthermore, the trash melting furnace concerning claim 4 is characterized by introducing the inert gas for antioxidizing into said resistance heating element in claim 1 thru/or invention [which / of 3] again.
[0022] In invention concerning this claim 4, since the inert gas for antioxidizing is introduced into the resistance heating element, oxidation of the graphite granular object which constitutes a resistance heating element can be prevented certainly, and generating of unnecessary exhaust gas can be prevented certainly.
[0023] In addition, the trash melting furnace concerning claim 5 is further characterized by said melt blowdown device being opened for free passage by the lowest edge side of a vertical mold crucible in claim 1 thru/or invention [which / of 4].
[0024] In invention concerning this claim 5, it can discharge smoothly, without a non-melt mixing in melt, since the melt blowdown section is opened for free passage by the bottom side of a vertical mold crucible.
[0025] Moreover, the trash melting furnace concerning claim 6 is set they to be [any of invention concerning claim 1 thru/or 5], and the melting raw material thrown in by said feeding device is characterized by being the object which added the additive to any one or such mixture, such as domestic-wastes burned ash, fly ash, industrial waste refuse, organic sludge, inorganic sludge, and coal ash, and was adjusted to them.
[0026] In invention concerning this claim 6, melting processing of the object which added the additive to any one or such mixture, such as domestic-wastes burned ash, fly ash, industrial waste refuse, organic sludge, inorganic sludge, and coal ash, and was adjusted to them can be carried out certainly.
[0027]

[Embodiment of the Invention] The trash melting furnace which starts this invention below is explained in full detail with reference to a drawing. Drawing 1 and drawing 2 are drawings of longitudinal section and the cross-sectional views showing the gestalt of operation of this invention.

[0028] Among drawing, one is a trash melting furnace and is equipped with the furnace main part 2 which presented the shape of a closed-end rectangular pipe, and opened the upper surface, and the door 3 blockaded for the upper surface, enabling free closing motion.

[0029] The two-layer firebrick layer 4 in which the furnace main part 2 was formed in the shape of a closed-end rectangular pipe, and silicon carbide (SiC) **** 5 arranged in the inner skin side, The counterelectrodes 6 and 7 of the couple which maintained predetermined distance and was arranged as shown in the inner circumference section of this silicon carbide **** 5 at drawing 2 , It has the vertical mold crucible 8 arranged in the center section of silicon carbide **** 5, and a counterelectrode 6 and the resistance heating element 9 which was between seven, and all the upper and lower sides and sides were covered with the space section between silicon carbide **** 5 and the vertical mold crucible 8, and was arranged in it by silicon carbide **** 5.

[0030] Here, two kinds of graphite granular objects of the graphite granular object with which the classification of the resistance heating element 9 was carried out to the diameter of 2.5-5.0mm, and the graphite granular object by which the classification was carried out to the diameter of 6-12mm are mixed [former] at a volume mixing rate of the 13 to 15 section in the latter to the one section.

[0031] Thus, while a graphite granular object with a small grain size can enter moderately between graphite granular objects with a large grain size, being able to be in a suitable circumferential dense condition, being able to raise the current density per unit volume and being able to aim at buildup of a power load by mixing two kinds of graphite granular objects for the resistance heating element 9 at a predetermined volume mixing rate, the endurance of the resistance heating element 9 can be raised.

[0032] moreover, to the resistance heating element 9 and inner circumference side of silicon carbide **** 5 Inert gas, such as nitrogen gas, is supplied from the inert gas inlet 10, and it is pressurized so that the resistance heating element 9 and the inner circumference section of silicon carbide **** 5 may serve as positive pressure from an upper pressure from the upper bed of the vertical mold crucible 8. While preventing certainly that the exhaust gas accompanying melting of a melting material invades into the resistance heating element 9 and silicon carbide **** 5 so that it may mention later, these oxidation can be prevented certainly.

[0033] Furthermore, the melt blowdown device 12 which penetrates silicon carbide **** 5 and the firebrick layer 4 to the lowest one end lateral portion of the vertical mold crucible 8 is opened for free passage.

[0034] This melt blowdown device 12 consists of the molten metal nozzle 13 by which the end was inserted in the vertical mold crucible 8, the flow control section 14 which controls that opening area arranged by the other end of this molten metal nozzle 13, and performs control of flow, a saucer 15 which receives the melt which flows down from this flow control section 14, and tap opening 17 inserted in the flowing-down path 16 which opens for free passage on this saucer 15 and is extended caudad.

[0035] Here, out of the furnace main part 2 of the molten metal nozzle 13, as shown in drawing 2 , a space heater 19 is looped around, and smooth moreover, it can discharge in the condition in which a quantum is possible, without solidifying melt with this space heater 19.

[0036] Moreover, trespass of the air from the tap opening 17 is prevented by the inert gas inlet's 18 being opened for free passage by the flowing-down path 16, and introducing inert gas, such as nitrogen gas.

[0037] While counter that soffit side at the vertical mold crucible 8, and the circular crevice 21 of a diameter equal to that bore is formed in the door 3 on the other hand, carrying out a opening to the side attachment wall of this circular crevice 21, penetrating the door 3 and arranging the feeding device 22, the exhaust gas exhaust passage 25 which carries out a opening to the pars basilaris ossis occipitalis of the circular crevice 21, and penetrates the door 3 up, and has a pressure regulating valve 24 is opened for free passage.

[0038] Here, furnace internal pressure can adjust a pressure regulating valve 24 to 10 - 50mmH2 O, and the inside of the circular crevice 21 is maintained to positive pressure.
[0039] The feeding device 22 has the quantum screw feeder 30 it was connected [quantum / opening / by the side of the soffit of the raw material hopper 28 which stores the melting raw material supplied through the upside feeding way 26 and the upside up slide valve 27, and this hopper 28 / logging] at the soffit side of the arranged lower slide valve 29.
[0040] Here, the inert gas inlet 31 for inert gas to remove the air which a melting raw material carries in on the pars-basilaris-ossis-occipitalis side attachment wall of the raw material hopper 28 is opened for free passage, and the air in a hopper 28 can be replaced by inert gas by introducing inert gas, such as nitrogen gas, from the inert gas inlet 31 in the condition of having opened closing and the up slide valve 27 for the lower slide valve 29.
[0041] Moreover, it is the object which added the additive to any one or such mixture, such as domestic-wastes burned ash, fly ash, industrial waste refuse, organic sludge, inorganic sludge, and coal ash, and was adjusted to them as a melting raw material supplied through the feeding way 26.
[0042] Although the above is the configuration which shows an example of the gestalt of operation of this invention, the actuation is explained below. Now, the melting raw material of the specified quantity is fed into the raw material hopper 28, the lower slide valve 29 is opened in the condition that the interior is filled with the inert gas from the inert gas inlet 31, and the quantum charge of the melting raw material is carried out on the melt in the vertical mold crucible 8 with the quantum screw feeder 30 of the feeding device 22.
[0043] At this time, to counterelectrodes 6 and 7, the direct-current high power from DC power supply energizes, the resistance heating element 9 is in the febrile state, and sequential melting of the melting raw material thrown in is carried out by heating the vertical mold crucible 8 to predetermined temperature.
[0044] Moreover, the melt which carried out long duration stagnation into the vertical mold crucible 8 and which was fused thoroughly is discharged, without a non-melt mixing outside through the tap opening 17, controlling the flow in the flow control section 14 through the molten metal nozzle 13 of the melt blowdown device 12 prepared in the lower part of the vertical mold crucible 8.
[0045] Since most harmful matter contained in a melting raw material when the thrown-in melting raw material piles up in the long duration vertical mold crucible 8 at this time will evaporate, it will be contained in exhaust gas and a ** collection is discharged and carried out out of a system through the exhaust gas exhaust passage 25, it is prevented certainly that an impurity is mixed in the melt discharged, and it becomes reusable.
[0046] And since the perimeter of a saucer 15 and the molten metal nozzle 13 is full, the inert gas from the inert gas inlet 18 prevents trespass of the air from the outside, prevents oxidation of the melt blowdown device 12, and is raising endurance, while the melt discharged from the vertical mold crucible 8 is discharged outside smoothly, without solidifying by being heated by the space heater 19 around which the surroundings of the molten metal nozzle 13 were looped.
[0047] Furthermore, the resistance heating element 9 and silicon carbide **** 5 which are arranged in the surroundings of the vertical mold crucible 8 of the furnace main part 2 Since it is maintained so that it may become positive pressure with the inert gas supplied from the inert gas inlet 10 as compared with the upper part side of the vertical mold crucible 8 Invading into silicon carbide **** 5 in which the exhaust gas which occurs in the vertical mold crucible 8 contains the resistance heating element 9 is prevented certainly. By this Oxidation of counterelectrodes 6 and 7 and the resistance heating element 9 and the corrosion of silicon carbide **** 5 can be prevented, and the endurance of the furnace main part 2 can be substantially raised as compared with the conventional example.
[0048] In addition, although the case where the side attachment wall of the bottom of the vertical mold crucible 8 was made to open the melt blowdown device 12 for free passage was explained, it is not limited to this and you may make it make the location where an internal non-melt is not mixed below the center section of the vertical direction of the vertical mold crucible 8 open the melt blowdown device 12 for free passage in the gestalt of the above-mentioned operation.

[0049] Moreover, although the gestalt of the above-mentioned operation explained the case where the quantum screw feeder 30 was applied to the feeding device 22, it is not limited to this, and may be made to perform quantum logging with the application of a rotary feeder, and you may make it apply a belt feeder further.
[0050]
[Effect of the Invention] Since silicon carbide **** is arranged in the perimeter of the graphite granular object which constitutes a resistance heating element according to invention concerning claim 1 while energy efficiency improves, since it heats with the resistance heating element which the melting raw material was thrown into the vertical mold crucible, and was arranged in the perimeter as explained above, these oxidation can be prevented and generating of unnecessary exhaust gas can be controlled.
[0051] Moreover, without a non-melt mixing, since the exhaust port of the melt in a vertical mold crucible is arranged in the lower part side of a vertical mold crucible, melt can be smoothly discharged outside a furnace, quantification becomes possible, and recycling can be attained.
[0052] Furthermore, while the graphite granular object of another side can enter between one graphite granular objects, being able to be in a circumferential dense condition, being able to raise the current density per unit volume and being able to aim at buildup of a power load by constituting a resistance heating element from mixture of the graphite granular object which classified in two kinds, the endurance of a resistance heating element can be raised.
[0053] Furthermore, while there is no load effect and a power-factor is large, the trouble of the consumption by the local heating directly under an electrode by electric failures, such as an electric noise and a flicker, the noise, and the arc is certainly avoidable, and since a heating element is an electric resistance type, since quiet melting is possible, moreover, non-melt does not mix in melt again.
[0054] Furthermore, without a non-melt mixing, since the exhaust port of the melt in a vertical mold crucible is arranged in the lower part side of a vertical mold crucible, melt can be smoothly discharged outside a furnace, quantification becomes possible, and recycling can be attained.
[0055] Moreover, while according to invention concerning claim 2 the graphite granular object of the grain size of the smaller one can enter moderately between the graphite granular objects of the grain size of the larger one, being able to be in a good circumferential dense condition, being able to raise the current density per unit volume and being able to aim at buildup of a power load by choosing the above-mentioned grain size and a volume mixing rate, the endurance of a resistance heating element can be raised.
[0056] Furthermore, according to invention concerning claim 3, since all the perimeters of the mixture of a graphite granular object are covered by silicon carbide ****, oxidation of a graphite granular object can be prevented certainly and generating of unnecessary exhaust gas can be prevented certainly.
[0057] Furthermore, since the inert gas for antioxidizing is introduced into the resistance heating element, while according to invention concerning claim 4 this inert gas can maintain the periphery section upper part side of an influx and a vertical mold crucible to positive pressure higher than an outside atmospheric pressure around a resistance heating element and a counterelectrode and prevents oxidation of a counterelectrode and a resistance heating element again, the corrosion of the firebrick by exhaust gas can be prevented and the endurance of a trash melting furnace can be raised. For this reason, the amount of exhaust gas can be decreased only as exhaust gas which generates most amounts of exhaust gas from a raw material, the amount of exhaust gas can have, last dust content can also be decreased, reduction of the gas presentation with still severer regulation values, such as NOx in exhaust gas and SOx, is attained, and generating of secondary nuisance can be controlled.
[0058] Furthermore, it can discharge smoothly, without according to invention concerning claim 5, a non-melt mixing in melt, since the melt blowdown section is opened for free passage by the bottom side of a vertical mold crucible.
[0059] Furthermore, according to invention concerning claim 6, melting processing of the object which added the additive to any one or such mixture, such as domestic-wastes burned ash, fly ash, industrial waste refuse, organic sludge, inorganic sludge, and coal ash, and was adjusted to them can be carried out certainly again.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] It is the trash melting furnace which is equipped with the following and characterized by said resistance heating element consisting of silicon carbide **** which arranged a graphite granular object of predetermined grain size which classified in two kinds in the perimeter of mixture mixed at a predetermined volume mixing rate, and this graphite granular object. A furnace main part which opened an upper bed A vertical mold crucible equipped with the door blockaded for an upper bed of this furnace main part, enabling free closing motion by which a melting raw material arranged in the center section is thrown into said furnace main part A counterelectrode of a couple which maintained a predetermined gap and was arranged in the surroundings of this vertical mold crucible A melt blowdown device opened for free passage by a resistance heating element with which it filled up between this counterelectrode and said vertical mold crucible, and the lower part side side of said vertical mold crucible
[Claim 2] It is the trash melting furnace according to claim 1 which one side of predetermined grain size of said graphite granular object is made into a diameter of 2.5-5.0mm, and the classification of another side is carried out to a diameter of 6-12mm, and is characterized by mixing [former] both at a volume mixture rate of the 13 to 15 section in the latter to the one section.
[Claim 3] A trash melting furnace according to claim 1 or 2 characterized by covering all bases of mixture of said graphite granular object, the sides, and upper surfaces by silicon carbide ****.
[Claim 4] A trash melting furnace given in claim 1 thru/or any of 3 they are. [which is characterized by introducing inert gas for antioxidizing into said resistance heating element]
[Claim 5] Said melt blowdown device is a trash melting furnace given in claim 1 thru/or any of 4 they are. [which is characterized by the lowest edge side of a vertical mold crucible being open for free passage]
[Claim 6] A melting raw material thrown into said vertical mold crucible is a trash melting furnace given in claim 1 thru/or any of 5 they are. [which is characterized by being the object which added an additive to any one or such mixture, such as domestic-wastes burned ash, fly ash, industrial waste refuse, organic sludge, inorganic sludge, and coal ash, and was adjusted to them]

[Translation done.]